CLAIMS

1. A gait generating system for a mobile robot that sets a permissible range of a predetermined floor reaction force component of a floor reaction force generated by a motion of a mobile robot and generates a desired gait that includes at least a desired motion of a mobile robot such that the permissible range is satisfied, comprising:

a provisional desired motion creating means for creating a provisional motion, which indicates a provisional value of the desired motion, by using a predetermined first dynamic model of the mobile robot such that the floor reaction force component satisfies the permissible range;

a floor reaction force component error calculating means for determining, on an arbitrary motion of the mobile robot, by using the first dynamic model and a predetermined second dynamic model having a dynamic accuracy that is higher than that of the first mobile dynamic model, a floor reaction force component error, which is a difference between the floor reaction force component generated on the second dynamic model by the motion and the floor reaction force component generated on the first dynamic model by the motion;

an evaluating means for evaluating whether a floor reaction force component error determined by the floor reaction force component error calculating means from the created provisional motion falls within a predetermined permissible error range; and

a desired motion determining means for determining the

provisional motion as the desired motion if a floor reaction force component error associated with the provisional motion in the evaluation by the evaluating means falls within the permissible error range, or for determining the desired motion by correcting the provisional motion at least once or more if a floor reaction force component error associated with the provisional motion deviates from the permissible error range,

wherein in a case where a floor reaction force component error associated with the provisional motion deviates from the permissible error range, if a corrected motion determined by the desired motion determining means by an n-th (n: integer satisfying $n \geq 1$) correction of the provisional motion is defined as a motion after an n-th correction, a floor reaction force component error determined by the floor reaction force component error calculating means from the motion after the n-th correction is defined as an n-th floor reaction force component error, the provisional motion is defined as the motion after a 0-th correction, and a floor reaction force component error associated with the provisional motion is defined as a 0-th floor reaction force component error, then

the desired motion determining means repeats corrected motion determination processing for determining a motion after an n-th correction such that a result obtained by adding either an (n-1)th floor reaction force component error or a floor reaction force correction amount determined on the basis of at least the (n-1)th floor reaction force component error to the floor reaction force component produced on the first dynamic

model by the motion after the n-th correction satisfies the permissible range and convergence discrimination processing for discriminating whether a floor reaction force component error change amount ΔFM defined as either a difference between an n-th floor reaction force component error associated with the determined motion after the n-th correction and an (n-1)th floor reaction force component error associated with a motion after the (n-1)th correction or a difference between the n-th floor reaction force component error and the floor reaction force correction amount determined on the basis of at least the (n-1)th floor reaction force component error has converged to zero until the desired motion determining means determines at least that the floor reaction force component error change amount ΔFM has converged to zero, and determines a corrected motion determined by last corrected motion determination processing in the repetitive processing as the desired motion.

2. A gait generating system for a mobile robot that sets a permissible range of a predetermined floor reaction force component of a floor reaction force generated by a motion of a mobile robot and generates a desired gait that includes at least a desired motion of a mobile robot such that the permissible range is satisfied, comprising:

a provisional desired motion creating means for creating a provisional motion, which indicates a provisional value of the desired motion;

a floor reaction force component error calculating means

for determining, on an arbitrary motion of the mobile robot, by using a predetermined first dynamic model of the mobile robot and a predetermined second dynamic model having a dynamic accuracy that is higher than that of the first mobile dynamic model, a floor reaction force component error, which is a difference between the floor reaction force component generated on the second dynamic model by the motion and the floor reaction force component generated on the first dynamic model by the motion; and

a desired motion determining means for determining the desired motion by correcting the provisional motion at least once or more,

wherein provided that a corrected motion determined by the desired motion determining means by an n-th (n: integer satisfying $n \geq 1$) correction of the provisional motion is defined as a motion after an n-th correction, a floor reaction force component error determined by the floor reaction force component error calculating means from the motion after the n-th correction is defined as an n-th floor reaction force component error, the provisional motion is defined as the motion after a 0-th correction, and a floor reaction force component error determined by the floor reaction force component error calculating means from the provisional motion is defined as a 0-th floor reaction force component error, then

the desired motion determining means repeats corrected motion determination processing for determining a motion after an n-th correction such that a result obtained by adding either

an (n-1)th floor reaction force component error or a floor reaction force correction amount determined on the basis of at least the (n-1)th floor reaction force component error to the floor reaction force component produced on the first dynamic model by the motion after the n-th correction satisfies the permissible range and convergence discrimination processing for discriminating whether a floor reaction force component error change amount ΔFM defined as either a difference between an n-th floor reaction force component error associated with the determined motion after the n-th correction and an (n-1)th floor reaction force component error associated with a motion after the (n-1)th correction or a difference between the n-th floor reaction force component error and the floor reaction force correction amount determined on the basis of at least the (n-1)th floor reaction force component error has converged to zero until the desired motion determining means determines at least that the floor reaction force component error change amount ΔFM has converged to zero, and determines a corrected motion determined by last corrected motion determination processing in the repetitive processing as the desired motion.

3. A gait generating system for a mobile body that sets a desired value of a predetermined first floor reaction force component of a floor reaction force generated by a motion of a mobile robot and a permissible range of a predetermined second floor reaction force component, which is different from the first floor reaction force component, and generates a desired

gait that includes at least a desired motion of the mobile robot such that the desired value of the first floor reaction force component and the permissible range of the second floor reaction force component are satisfied, comprising:

a provisional desired motion creating means for creating a provisional motion, which indicates a provisional value of the desired motion, by using a predetermined first dynamic model of the mobile robot such that the first floor reaction force component agrees with the desired value and the second floor reaction force component satisfies the permissible range;

a floor reaction force component error calculating means for determining, on an arbitrary motion of the mobile robot, by using the first dynamic model and a predetermined second dynamic model having a dynamic accuracy that is higher than that of the first dynamic model, a floor reaction force component error Aerr, which is a difference between the first floor reaction force component generated on the second dynamic model by the motion and the first floor reaction force component generated on the first dynamic model by the motion, and for determining a floor reaction force component error Berr, which is a difference between the second floor reaction force component generated on the second dynamic model by the motion and the second floor reaction force component generated on the first dynamic model by the motion;

an evaluating means for evaluating whether the floor reaction force component error Aerr out of the floor reaction force component errors Aerr and Berr determined by the floor

reaction force component error calculating means from the created provisional motion falls within a predetermined first permissible error range and whether the floor reaction force component error Berr falls within a predetermined second permissible error range; and

a desired motion determining means for determining the provisional motion as the desired motion if the floor reaction force component errors Aerr and Berr associated with the provisional motion in the evaluation by the evaluating means both fall within the first permissible error range and the second permissible error range, respectively, associated therewith or for determining the desired motion by correcting the provisional motion at least once or more if at least one of the floor reaction force component errors Aerr and Berr associated with the provisional motion deviates from the first permissible error range or the second permissible error range associated therewith,

wherein in case where at least one of the floor reaction force component errors Aerr and Berr associated with the provisional motion deviates from the first permissible error range or the second permissible error range associated therewith, if a corrected motion determined by the desired motion determining means by an n-th (n: integer satisfying $n \geq 1$) correction of the provisional motion is defined as a motion after an n-th correction, the floor reaction force component errors Aerr and Berr determined by the floor reaction force component error calculating means from the motion after the n-th

correction are respectively defined as n-th floor reaction force component errors Aerr(n) and Berr(n), the provisional motion is defined as a motion after a 0-th correction, and the floor reaction force component errors Aerr and Berr associated with the provisional motion are respectively defined as 0-th floor reaction force component errors Aerr(0) and Berr(0), then

the desired motion determining means repeats corrected motion determination processing for determining a motion after an n-th correction such that a result obtained by adding either an (n-1)th floor reaction force component error Aerr(n-1) or a first floor reaction force correction amount determined on the basis of at least the (n-1)th floor reaction force component error Aerr(n-1) to the first floor reaction force component produced on the first dynamic model by the motion after the n-th correction agrees with the desired value, and a result obtained by adding either an (n-1)th floor reaction force component error Berr(n-1) or a second floor reaction force correction amount determined on the basis of at least the (n-1)th floor reaction force component error Berr(n-1) to the second floor reaction force component produced on the first dynamic model by the motion after the n-th correction satisfies the permissible range, and convergence discrimination processing for discriminating whether a floor reaction force component error change amount ΔAerr defined as either a difference between an n-th floor reaction force component error Aerr(n) associated with the determined motion after the n-th correction and an (n-1)th floor reaction force component error Aerr(n-1)

associated with a motion after the (n-1)th correction or a difference between the n-th floor reaction force component error Aerr(n) and the first floor reaction force correction amount determined on the basis of at least the (n-1)th floor reaction force component error Aerr(n-1) and a floor reaction force component error change amount ΔBerr defined as either a difference between an n-th floor reaction force component error Berr(n) associated with the determined motion after the n-th correction and an (n-1)th floor reaction force component error Berr(n-1) associated with a motion after the (n-1)th correction or a difference between the n-th floor reaction force component error Berr(n) and the second floor reaction force correction amount determined on the basis of at least the (n-1)th floor reaction force component error Berr(n-1) have respectively converged to zero or not until the desired motion determining means determines at least that the floor reaction force component error change amounts ΔAerr and ΔBerr have both converged to zero, and determines a corrected motion determined by the last corrected motion determination processing in the repetitive processing as the desired motion.

4. A gait generating system for a mobile body that sets a desired value of a predetermined first floor reaction force component of a floor reaction force generated by a motion of a mobile robot and a permissible range of a predetermined second floor reaction force component, which is different from the first floor reaction force component, and generates a desired

gait that includes at least a desired motion of the mobile robot such that the desired value of the first floor reaction force component and the permissible range of the second floor reaction force component are satisfied, comprising:

a provisional desired motion creating means for creating a provisional motion, which indicates a provisional value of the desired motion;

a floor reaction force component error calculating means for determining, on an arbitrary motion of the mobile robot, by using a predetermined first dynamic model of the mobile robot and a predetermined second dynamic model having a dynamic accuracy that is higher than that of the first dynamic model, a floor reaction force component error Aerr, which is the difference between the first floor reaction force component generated on the second dynamic model by the motion and the first floor reaction force component generated on the first dynamic model by the motion, and for determining a floor reaction force component error Berr, which is the difference between the second floor reaction force component generated on the second dynamic model by the motion and the second floor reaction force component generated on the first dynamic model by the motion; and

a desired motion determining means for determining the desired motion by correcting the provisional motion at least once or more,

wherein provided that a corrected motion determined by the desired motion determining means by an n-th (n: integer

satisfying n≥1) correction of the provisional motion is defined as a motion after an n-th correction, the floor reaction force component errors Aerr and Berr determined by the floor reaction force component error calculating means from the motion after the n-th correction are respectively defined as n-th floor reaction force component errors Aerr(n) and Berr(n), the provisional motion is defined as a motion after a 0-th correction, and the floor reaction force component errors Aerr and Berr determined by the floor reaction force component error calculating means from the provisional motion are respectively defined as 0-th floor reaction force component errors Aerr(0) and Berr(0), then

the desired motion determining means repeats corrected motion determination processing for determining a motion after an n-th correction such that a result obtained by adding either an (n-1)th floor reaction force component error Aerr(n-1) or a first floor reaction force correction amount determined on the basis of at least the (n-1)th floor reaction force component error Aerr(n-1) to the first floor reaction force component produced on the first dynamic model by the motion after the n-th correction agrees with the desired value, and a result obtained by adding either an (n-1)th floor reaction force component error Berr(n-1) or a second floor reaction force correction amount determined on the basis of at least the (n-1)th floor reaction force component error Berr(n-1) to the second floor reaction force component produced on the first dynamic model by the motion after the n-th correction satisfies the permissible

range, and convergence discrimination processing for discriminating whether a floor reaction force component error change amount ΔAerr defined as either a difference between an n-th floor reaction force component error Aerr(n) associated with the determined motion after the n-th correction and an (n-1)th floor reaction force component error Aerr(n-1) associated with a motion after the (n-1)th correction or a difference between the n-th floor reaction force component error Aerr(n) and the first floor reaction force correction amount determined on the basis of at least the (n-1)th floor reaction force component error Aerr(n-1) and a floor reaction force component error change amount ΔBerr defined as either a difference between an n-th floor reaction force component error Berr(n) associated with the determined motion after the n-th correction and an (n-1)th floor reaction force component error Berr(n-1) associated with a motion after the (n-1)th correction or a difference between the n-th floor reaction force component error Berr(n) and the second floor reaction force correction amount determined on the basis of at least the (n-1)th floor reaction force component error Berr(n-1)have respectively converged to zero or not until the desired motion determining means determines at least that the floor reaction force component error change amounts ΔAerr and ΔBerr have both converged to zero, and determines a corrected motion determined by the last corrected motion determination processing in the repetitive processing as the desired motion.

5. The gait generating system for a mobile robot according to Claim 1 or 2, wherein the floor reaction force component is a translational floor reaction force horizontal component of a floor reaction force action on the mobile robot.

6. The gait generating system for a mobile robot according to Claim 3 or 4, wherein the first floor reaction force component is a floor reaction force moment horizontal component about a predetermined point of action of a floor reaction force acting on the mobile robot, and the second floor reaction force component is a translational floor reaction force horizontal component of a floor reaction force acting on the mobile robot.

7. A gait generating system for a mobile robot that sets a desired ZMP of a mobile robot and a permissible range of a translational floor reaction force horizontal component produced by a motion of the mobile robot, and generates a desired gait that includes at least a desired motion of the mobile robot such that the desired ZMP and the permissible range of the translational floor reaction force horizontal component are satisfied, comprising:

a provisional desired motion creating means for creating a provisional motion, which indicates a provisional value of the desired motion, by using a predetermined first dynamic model of the mobile robot such that the desired ZMP is satisfied and the translational floor reaction force horizontal component satisfies the permissible range;

an error calculating means for determining, on an arbitrary motion of the mobile robot, by using the first dynamic model and a predetermined second dynamic model having a dynamic accuracy that is higher than that of the first dynamic model, a ZMP error ZMPerr, which is a difference between a ZMP calculated on the second dynamic model in response to the motion and a ZMP calculated on the first dynamic model in response to the motion, and for determining a translational floor reaction force horizontal component error Ferr, which is the difference between the translational floor reaction force horizontal component generated on the second dynamic model by the motion and the translational floor reaction force horizontal component generated on the first dynamic model by the motion;

an evaluating means for evaluating whether a ZMP error ZMPerr determined by the error calculating means from the created provisional motion and a ZMP error ZMPerr out of a translational floor reaction force horizontal component error Ferr fall within a predetermined first permissible error range and for evaluating whether the translational floor reaction force horizontal component error Ferr falls within a predetermined second permissible error range; and

a desired motion determining means for determining, in the evaluation by the evaluating means, the provisional motion as the desired motion if both ZMP error ZMPerr and translational floor reaction force horizontal component error Ferr associated with the provisional motion respectively fall within the first permissible error range and the second permissible error range

associated therewith, or for determining the desired motion by correcting the provisional motion at least once or more if at least either the ZMP error ZMPerr or the translational floor reaction force horizontal component error Ferr associated with the provisional motion deviates from the first permissible error range or the second permissible error range associated therewith,

wherein in a case where at least either the ZMP error ZMPerr or the translational floor reaction force horizontal component error Ferr associated with the provisional motion deviates from the first permissible error range or the second permissible error range associated therewith, if a corrected motion determined by the desired motion determining means by an n-th (n: integer satisfying $n \geq 1$) correction of the provisional motion is defined as a motion after an n-th correction, a ZMP error ZMPerr and a translational floor reaction force horizontal component error Ferr determined by the floor reaction force component error calculating means from the motion after the n-th correction are defined as an n-th ZMP error ZMPerr(n) and an n-th translational floor reaction force horizontal component error Ferr(n), respectively, the provisional motion is defined as a motion after a 0-th correction, and the ZMP error ZMPerr and the translational floor reaction force horizontal component error Ferr associated with the provisional motion are defined as a 0-th ZMP error ZMPerr(0) and a 0-th translational floor reaction force horizontal component error Ferr(0), respectively, then

the desired motion determining means repeats corrected motion determination processing for determining a motion after an n-th correction such that a result obtained by adding either an (n-1)th ZMP error ZMPerr(n-1) or a ZMP correction amount determined on the basis of at least the (n-1)th ZMP error ZMPerr(n-1) to a ZMP calculated on the first dynamic model by the motion after the n-th correction agrees with the desired ZMP, and the result obtained by adding either an (n-1)th translational floor reaction force horizontal component error Ferr(n-1) or a floor reaction force correction amount determined on the basis of at least the (n-1)th translational floor reaction force horizontal component error Ferr(n-1) to the translational floor reaction force horizontal component produced on the first dynamic model by the motion after the n-th correction satisfies the permissible range, and convergence discrimination processing for discriminating whether a ZMP error change amount ΔZMPerr defined as either a difference between an n-th ZMP error ZMPerr(n) associated with the determined motion after the n-th correction and an (n-1)th ZMP error ZMPerr(n-1) associated with a motion after an (n-1)th correction or a difference between the n-th ZMP error ZMPerr(n) and the ZMP correction amount determined on the basis of at least the (n-1)th ZMP error ZMPerr(n-1), and a translational floor reaction force horizontal component error change amount ΔFerr defined as either a difference between an n-th translational floor reaction force horizontal component error Ferr(n) associated with the determined motion after the n-th correction

and an (n-1)th translational floor reaction force horizontal component error Ferr(n-1) associated with a motion after an (n-1)th correction or a difference between the n-th translational floor reaction force horizontal component error Ferr(n) and the floor reaction force correction amount determined on the basis of at least the (n-1)th translational floor reaction force horizontal component error Ferr(n-1) have respectively converged to zero or not until the desired motion determining means determines at least that both the ZMP error change amount ΔZMPerr and the translational floor reaction force horizontal component error change amount ΔFerr have converged to zero, and determines, as the desired motion, a corrected motion determined by last corrected motion determination processing in the repetitive processing.

8. A gait generating system for a mobile robot that sets a desired ZMP of a mobile robot and a permissible range of a translational floor reaction force horizontal component produced by a motion of the mobile robot, and generates a desired gait that includes at least a desired motion of the mobile robot such that the desired ZMP and the permissible range of the translational floor reaction force horizontal component are satisfied, comprising:

a provisional desired motion creating means for creating a provisional motion, which indicates a provisional value of the desired motion;

an error calculating means for determining, on an

arbitrary motion of the mobile robot, by using a predetermined first dynamic model of the mobile robot and a predetermined second dynamic model having a dynamic accuracy that is higher than that of the first dynamic model, a ZMP error ZMPerr, which is the difference between a ZMP calculated on the second dynamic model in response to the motion and a ZMP calculated on the first dynamic model in response to the motion, and for determining a translational floor reaction force horizontal component error Ferr, which is the difference between the translational floor reaction force horizontal component generated on the second dynamic model by the motion and the translational floor reaction force horizontal component generated on the first dynamic model by the motion; and

a desired motion determining means for determining the desired motion by correcting the provisional motion at least once or more,

wherein provided that a corrected motion determined by the desired motion determining means by an n-th (n: integer satisfying $n \geq 1$) correction of the provisional motion is defined as the motion after the n-th correction, a ZMP error ZMPerr and a translational floor reaction force horizontal component error Ferr determined by the floor reaction force component error calculating means from the motion after the n-th correction are defined as an n-th ZMP error ZMPerr(n) and an n-th translational floor reaction force horizontal component error Ferr(n), respectively, the provisional motion is defined as the motion after a 0-th correction, and the ZMP error ZMPerr and the

translational floor reaction force horizontal component error Ferr determined by the floor reaction force component error calculating means from the provisional motion are defined as a 0-th ZMP error ZMPerr(0) and a 0-th translational floor reaction force horizontal component error Ferr(0), respectively, then

the desired motion determining means repeats corrected motion determination processing for determining a motion after an n-th correction such that a result obtained by adding either an (n-1)th ZMP error ZMPerr(n-1) or a ZMP correction amount determined on the basis of at least the (n-1)th ZMP error ZMPerr(n-1) to a ZMP calculated on the first dynamic model by the motion after the n-th correction agrees with the desired ZMP, and the result obtained by adding either an (n-1)th translational floor reaction force horizontal component error Ferr(n-1) or a floor reaction force correction amount determined on the basis of at least the (n-1)th translational floor reaction force horizontal component error Ferr(n-1) to the translational floor reaction force horizontal component produced on the first dynamic model by the motion after the n-th correction satisfies the permissible range, and convergence discrimination processing for discriminating whether a ZMP error change amount ΔZMPerr defined as either a difference between an n-th ZMP error ZMPerr(n) associated with the determined motion after the n-th correction and an (n-1)th ZMP error ZMPerr(n-1) associated with a motion after an (n-1)th correction or a difference between the n-th ZMP error ZMPerr(n)

and the ZMP correction amount determined on the basis of at least the (n-1)th ZMP error ZMPerr(n-1), and a translational floor reaction force horizontal component error change amount ΔFerr defined as either a difference between an n-th translational floor reaction force horizontal component error Ferr(n) associated with the determined motion after the n-th correction and an (n-1)th translational floor reaction force horizontal component error Ferr(n-1) associated with a motion after an (n-1)th correction or a difference between the n-th translational floor reaction force horizontal component error Ferr(n) and the floor reaction force correction amount determined on the basis of at least the (n-1)th translational floor reaction force horizontal component error Ferr(n-1) have respectively converged to zero or not until the desired motion determining means determines at least that both the ZMP error change amount ΔZMPerr and the translational floor reaction force horizontal component error change amount ΔFerr have both converged to zero, until it is determined that both have converged to zero, and determines, as the desired motion, a corrected motion determined by last corrected motion determination processing in the repetitive processing.

9. The gait generating system for a mobile robot according to Claim 3, wherein the floor reaction force component error calculating means calculates, relative to the provisional motion, the floor reaction force component error Aerr associated with the provisional motion by using the desired

value as the first floor reaction force component produced on the first dynamic model by the provisional motion, while the floor reaction force component error calculating means calculates, relative to a motion after an n-th correction other than the provisional motion, the floor reaction force component error Aerr associated with the motion after the n-th correction by using a result obtained by subtracting either the (n-1)th floor reaction force component error Aerr(n-1) or the first floor reaction force correction amount determined on the basis of at least the (n-1)th floor reaction force component error Aerr(n-1) from the desired value, as the first floor reaction force component produced on the first dynamic model by the motion after the n-th correction.

10. The gait generating system for a mobile robot according to Claim 4, wherein

the provisional motion creating means is a means for creating the provisional motion such that at least a desired value of the first floor reaction force component is satisfied on the first dynamic model, and

the floor reaction force component error calculating means calculates, relative to the provisional motion, the floor reaction force component error Aerr associated with the provisional motion as the first floor reaction force component, which is produced on the first dynamic model by the provisional motion, by using the desired value, while the floor reaction force component error calculating means calculates, relative

to a motion after an n-th correction other than the provisional motion, the floor reaction force component error Aerr associated with the motion after the n-th correction as the first floor reaction force component produced on the first dynamic model by the motion after the n-th correction, by using a result obtained by subtracting either the (n-1)th floor reaction force component error Aerr(n-1) or the first floor reaction force correction amount determined on the basis of at least the (n-1)th floor reaction force component error Aerr(n-1) from the desired value.

11. The gait generating system for a mobile robot according to Claim 7, wherein the floor reaction force component error calculating means calculates, relative to the provisional motion, the ZMP error ZMPerr associated with the provisional motion as the ZMP, which is calculated on the first dynamic model in response to the provisional motion, by using the desired ZMP, while the floor reaction force component error calculating means calculates, relative to a motion after an n-th correction other than the provisional motion, a ZMP error ZMPerr associated with the motion after the n-th correction as the ZMP calculated on the first dynamic model in response to the motion after the n-th correction, by using a result obtained by subtracting either the (n-1)th ZMP error ZMPerr(n-1) or the ZMP correction amount determined on the basis of at least the (n-1)th ZMP error ZMPerr(n-1) from the desired ZMP.

12. The gait generating system for a mobile robot according to Claim 8, wherein

the provisional motion creating means is a means for creating the provisional motion such that at least a desired ZMP is satisfied on the first dynamic model, and

the floor reaction force component error calculating means calculates, relative to the provisional motion, the ZMP error ZMPerr associated with the provisional motion as the ZMP, which is calculated on the first dynamic model in response to the provisional motion, by using the desired ZMP, while the floor reaction force component error calculating means calculates, relative to a motion after an n-th correction other than the provisional motion, a ZMP error ZMPerr associated with the motion after the n-th correction as the ZMP calculated on the first dynamic model in response to the motion after the n-th correction, by using a result obtained by subtracting either the (n-1)th ZMP error ZMPerr(n-1) or the ZMP correction amount determined on the basis of at least the (n-1)th ZMP error ZMPerr(n-1) from the desired ZMP.

13. The gait generating system for a mobile robot according to Claim 1, wherein

the desired motion, the provisional motion, and the corrected motion are composed of time series of the instantaneous values of motions of the mobile robot during a predetermined period,

the m-th floor reaction force component error (m: integer

satisfying $m \geq 0$) determined by the floor reaction force component error calculating means is composed of a time series of the difference in the predetermined period between an instantaneous value of the floor reaction force component produced on the second dynamic model at each time of a motion after an m-th correction by the motion after the m-th correction and an instantaneous value of the floor reaction force component produced on the first dynamic model at the time by the motion after the m-th correction,

the predetermined permissible error range of the evaluating means is a permissible error range for a predetermined first characteristic amount in a pattern of the time series constituting the 0-th floor reaction force component error,

the corrected motion determination processing by the desired motion determining means is the processing for determining, at each time t of the motion after the n-th correction, an instantaneous value of a motion after an n-th correction at the time t such that a result obtained by adding either a value at the time t of the (n-1)th floor reaction force component error or a value of a floor reaction force correction amount determined on the basis of at least the value to an instantaneous value FM(t) of the floor reaction force component produced on the first dynamic model at time t by the motion after the n-th correction satisfies the permissible range at the time t,

the floor reaction force component error change amount

ΔFM is composed of a time series, in the predetermined period, of either a difference between a value of the n-th floor reaction force component error at each time and a value of an (n-1)th floor reaction force component error at the time or a difference between a value of the n-th floor reaction force component error at each time and a value of the floor reaction force correction amount determined on the basis of at least a value of the (n-1)th floor reaction force component error at the time, and

the convergence discrimination processing of the desired motion determining means is the processing for determining that the floor reaction force component error change amount ΔFM has converged to zero when a predetermined second characteristic amount in a pattern of the time series constituting the floor reaction force component error change amount ΔFM falls within a predetermined permissible change amount range.

14. The gait generating system for a mobile robot according to Claim 2, wherein

the desired motion, the provisional motion, and the corrected motion are composed of time series of the instantaneous values of motions of the mobile robot during a predetermined period,

the m-th floor reaction force component error (m: integer satisfying $m \geq 0$) determined by the floor reaction force component error calculating means is composed of a time series of a difference in the predetermined period between an instantaneous value of the floor reaction force component

produced on the second dynamic model at each time of a motion after an m-th correction by the motion after the m-th correction and an instantaneous value of the floor reaction force component produced on the first dynamic model at the time by the motion after the m-th correction,

the corrected motion determination processing by the desired motion determining means is the processing for determining, at each time t of the motion after the n-th correction, an instantaneous value of a motion after an n-th correction at the time t such that a result obtained by adding either a value at the time t of the (n-1)th floor reaction force component error or a value of the floor reaction force correction amount determined on the basis of at least the value to an instantaneous value FM(t) of the floor reaction force component produced on the first dynamic model at time t by the motion after the n-th correction satisfies the permissible range at the time t,

the floor reaction force component error change amount ΔFM is composed of a time series in the predetermined period of either a difference between a value of the n-th floor reaction force component error at each time and a value of an (n-1)th floor reaction force component error at the time or a difference between a value of the n-th floor reaction force component error at each time and a value of the floor reaction force correction amount determined on the basis of at least a value of the (n-1)th floor reaction force component error at the time, and

the convergence discrimination processing of the desired

motion determining means is the processing for determining that the floor reaction force component error change amount ΔFM has converged to zero when a predetermined characteristic amount in a pattern of the time series constituting the floor reaction force component error change amount ΔFM has fallen within a predetermined permissible change amount range.

15. The gait generating system for a mobile robot according to Claim 3, wherein

the desired motion, the provisional motion, and the corrected motion are composed of time series of the instantaneous values of motions of the mobile robot during a predetermined period,

an m-th floor reaction force component error Aerr out of the m-th floor reaction force component errors Aerr and Berr (m: integer satisfying m≥0) determined by the floor reaction force component error calculating means is composed of a time series of a difference in the predetermined period between an instantaneous value of the first floor reaction force component produced on the second dynamic model at each time of a motion after an m-th correction by the motion after the m-th correction and an instantaneous value of the first floor reaction force component produced on the first dynamic model at the time by the motion after the m-th correction, and the m-th floor reaction force component error Berr is composed of a time series of a difference in the predetermined period between an instantaneous value of the second floor reaction force

component produced on the second dynamic model at each time of a motion after an m-th correction and an instantaneous value of the second floor reaction force component produced on the first dynamic model at the time by the motion after the m-th correction,

the predetermined first permissible error range of the evaluating means is a permissible error range for a predetermined first characteristic amount out of a time series pattern constituting the 0-th floor reaction force component error Aerr(0) and the predetermined second permissible error range is a permissible error range for a predetermined second characteristic amount out of a time series pattern constituting the 0-th floor reaction force component error Berr(0),

the corrected motion determination processing by the desired motion determining means is the processing for determining, at each time t of the motion after the n-th correction, an instantaneous value of a motion after an n-th correction at the time t such that a result obtained by adding either a value of the (n-1)th floor reaction force component error Aerr(n-1) at the time t or a value of the first floor reaction force correction amount determined on the basis of at least the value to an instantaneous value of the first floor reaction force component produced on the first dynamic model at time t by the motion after the n-th correction satisfies the desired value at the time t, and a result obtained by adding either a value of the (n-1)th floor reaction force component error Berr(n-1) at the time t or a value of the second floor

reaction force correction amount determined on the basis of at least the value to an instantaneous value of the second floor reaction force component produced on the first dynamic model at the time t by the motion after the n-th correction satisfies the permissible range at the time t,

the floor reaction force component error change amount ΔAerr is composed of a time series, in the predetermined period, of either a difference between a value of the n-th floor reaction force component error Aerr(n) at each time and a value of an (n-1)th floor reaction force component error Aerr(n-1) at the time or a difference between a value of the n-th floor reaction force component error Aerr(n) at each time and a value of the first floor reaction force correction amount determined on the basis of at least a value of the (n-1)th floor reaction force component error Aerr(n-1) at the time, and the floor reaction force component error change amount ΔBerr is composed of a time series, in the predetermined period, of either a difference between a value of the n-th floor reaction force component error Berr(n) at each time and a value of an (n-1)th floor reaction force component error Berr(n-1) at the time or a difference between a value of the n-th floor reaction force component error Berr(n) at each time and a value of the second floor reaction force correction amount determined on the basis of at least a value of the (n-1)th floor reaction force component error Berr(n-1) at the time, and

the convergence discrimination processing of the desired motion determining means is the processing for determining that

the floor reaction force component error change amount ΔAerr has converged to zero when a predetermined third characteristic amount in a pattern of the time series constituting the floor reaction force component error change amount ΔAerr has fallen within a predetermined permissible change amount range for the third characteristic amount and also for determining that the floor reaction force component error change amount ΔBerr has converged to zero when the fourth characteristic amount in a pattern of the time series constituting the floor reaction force component error change amount ΔBerr has fallen within a predetermined permissible change amount range for the fourth characteristic amount.

16. The gait generating system for a mobile robot according to Claim 3, wherein

the desired motion, the provisional motion, and the corrected motion are composed of time series of the instantaneous values of motions of the mobile robot during a predetermined period,

an m-th floor reaction force component error Aerr out of the m-th floor reaction force component errors Aerr and Berr (m: integer satisfying $m \geq 0$) determined by the floor reaction force component error calculating means is composed of a time series of a difference, in the predetermined period, between an instantaneous value of the first floor reaction force component produced on the second dynamic model at each time of a motion after an m-th correction by the motion after the m-th

correction and an instantaneous value of the first floor reaction force component produced on the first dynamic model at the time by the motion after the m-th correction, and the m-th floor reaction force component error Berr is composed of a time series of a difference, in the predetermined period, between an instantaneous value of the second floor reaction force component produced on the second dynamic model at each time of a motion after an m-th correction and an instantaneous value of the second floor reaction force component produced on the first dynamic model at the time by the motion after the m-th correction,

the corrected motion determination processing of the desired motion determining means is the processing for determining, at each time t of the motion after the n-th correction, an instantaneous value of a motion after an n-th correction at the time t such that a result obtained by adding either a value of the (n-1)th floor reaction force component error Aerr(n-1) at the time t or a value of the first floor reaction force correction amount determined on the basis of at least the value to an instantaneous value of the first floor reaction force component produced on the first dynamic model at time t by the motion after the n-th correction satisfies the desired value at the time t, and a result obtained by adding either a value of the (n-1)th floor reaction force component error Berr(n-1) at the time t or a value of the second floor reaction force correction amount determined on the basis of at least the value to an instantaneous value of the second floor

reaction force component produced on the first dynamic model at the time t by the motion after the n-th correction satisfies the permissible range at the time t,

the floor reaction force component error change amount ΔAerr is composed of a time series, in the predetermined period, of either a difference between a value of the n-th floor reaction force component error Aerr(n) at each time and a value of an (n-1)th floor reaction force component error Aerr(n-1) at the time or a difference between a value of the n-th floor reaction force component error Aerr(n) at each time and a value of the first floor reaction force correction amount determined on the basis of at least a value of the (n-1)th floor reaction force component error Aerr(n-1) at the time, and the floor reaction force component error change amount ΔBerr is composed of a time series, in the predetermined period, of either a difference between a value of the n-th floor reaction force component error Berr(n) at each time and a value of an (n-1)th floor reaction force component error Berr(n-1) at the time or a difference between a value of the n-th floor reaction force component error Berr(n) at each time and a value of the second floor reaction force correction amount determined on the basis of at least a value of the (n-1)th floor reaction force component error Berr(n-1) at the time, and

the convergence discrimination processing of the desired motion determining means is the processing for determining that the floor reaction force component error change amount ΔAerr has converged to zero when a predetermined third characteristic

amount in a pattern of the time series constituting the floor reaction force component error change amount ΔAerr has fallen within a predetermined permissible change amount range for the third characteristic amount and also for determining that the floor reaction force component error change amount ΔBerr has converged to zero when the fourth characteristic amount in a pattern of the time series constituting the floor reaction force component error change amount ΔBerr has fallen within a predetermined permissible change amount range for the fourth characteristic amount.

17. The gait generating system for a mobile robot according to Claim 7, wherein

the desired motion, the provisional motion, and the corrected motion are composed of time series of the instantaneous values of motions of the mobile robot during a predetermined period,

out of the m-th ZMP error ZMPerr and a translational floor reaction force horizontal component error Ferr (m: integer satisfying m≥0) determined by the floor reaction force component error calculating means, the m-th ZMP error ZMPerr is composed of a time series of a difference, in the predetermined period, between an instantaneous value of a ZMP calculated on the second dynamic model at each time of a motion after the m-th correction in response to the motion after the m-th correction and an instantaneous value of a ZMP calculated on the first dynamic model at the time in response to the motion

after the m-th correction, and the m-th translational floor reaction force horizontal component error Berr is composed of a time series of a difference, in the predetermined period, between an instantaneous value of the translational floor reaction force component produced on the second dynamic model at each time of a motion after an m-th correction and an instantaneous value of the translational floor reaction force horizontal component produced on the first dynamic model at the time by the motion after the m-th correction,

the predetermined first permissible error range of the evaluating means is a permissible error range for a predetermined first characteristic amount in a pattern of a time series constituting the 0-th ZMP error ZMPerr(0) and the predetermined second permissible error range is a permissible error range for a predetermined second characteristic amount in a pattern of a time series constituting the 0-th translational floor reaction force horizontal component error Ferr(0),

the corrected motion determination processing of the desired motion determining means is the processing for determining, at each time t of the motion after the n-th correction, an instantaneous value of a motion after an n-th correction at the time t such that a result obtained by adding either a value of the (n-1)th ZMP error ZMPerr(n-1) at time t or a value of the ZMP correction amount determined on the basis of at least the value to an instantaneous value of the ZMP calculated on the first dynamic model at time t in response to

the motion after the n-th correction satisfies the desired ZMP at the time t, and a result obtained by adding either a value of the (n-1)th translational floor reaction force horizontal component error Ferr(n-1) at the time t or a value of the floor reaction force correction amount determined on the basis of at least the value to an instantaneous value of a translational floor reaction force horizontal component produced on the first dynamic model at the time t by the motion after the n-th correction satisfies the permissible range at the time t,

the ZMP error change amount ΔZMPerr is composed of a time series, in the predetermined period, of either a difference between a value of the n-th ZMP error ZMPerr(n) at each time and a value of an (n-1)th ZMP error ZMPerr(n-1) at the time or a difference between a value of the n-th ZMP error ZMPerr(n) at each time and a value of the ZMP correction amount determined on the basis of at least a value of the (n-1)th ZMP error ZMPerr(n-1) at the time, and the translational floor reaction force horizontal component error change amount ΔFerr is composed of a time series, in the predetermined period, of either a difference between a value of the n-th translational floor reaction force horizontal component error Ferr(n) at each time and a value of an (n-1)th translational floor reaction force horizontal component error Ferr(n-1) at the time or a difference between a value of the n-th translational floor reaction force horizontal component error Ferr(n) at each time and a value of the floor reaction force correction amount determined on the basis of at least the value of the (n-1)th

translational floor reaction force horizontal component error Ferr(n-1) at the time, and

the convergence discrimination processing of the desired motion determining means is the processing for determining that the ZMP component error change amount ΔZMPerr has converged to zero when a predetermined third characteristic amount in a pattern of the time series constituting the ZMP error change amount ΔZMPerr has fallen within a predetermined permissible change amount range for the third characteristic amount and also for determining that the translational floor reaction force horizontal component error difference ΔFerr has converged to zero when a predetermined fourth characteristic amount in a pattern of the time series constituting the translational floor reaction force horizontal component error change amount ΔFerr has fallen within a predetermined permissible change amount range for the fourth characteristic amount.

18. The gait generating system for a mobile robot according to Claim 8, wherein

the desired motion, the provisional motion, and the corrected motion are composed of time series of the instantaneous values of motions of the mobile robot during a predetermined period,

out of the m-th ZMP error ZMPerr and a translational floor reaction force horizontal component error Ferr (m: integer satisfying $m \geq 0$) determined by the floor reaction force component error calculating means, the m-th ZMP error ZMPerr

is composed of a time series of a difference, in the predetermined period, between an instantaneous value of a ZMP calculated on the second dynamic model at each time of a motion after the m-th correction in response to the motion after the m-th correction and an instantaneous value of a ZMP calculated on the first dynamic model at the time in response to the motion after the m-th correction, and the m-th translational floor reaction force horizontal component error Berr is composed of a time series of a difference, in the predetermined period, between an instantaneous value of the translational floor reaction force horizontal component produced on the second dynamic model at each time of a motion after an m-th correction and an instantaneous value of the translational floor reaction force horizontal component produced on the first dynamic model at the time by the motion after the m-th correction,

the corrected motion determination processing of the desired motion determining means is the processing for determining, at each time t of the motion after the n-th correction, an instantaneous value of a motion after an n-th correction at the time t such that a result obtained by adding either a value of the (n-1)th ZMP error ZMPerr(n-1) at time t or a value of the ZMP correction amount determined on the basis of at least the value to an instantaneous value of the ZMP calculated on the first dynamic model at time t in response to the motion after the n-th correction satisfies the desired ZMP at the time t, and a result obtained by adding either a value of the (n-1)th translational floor reaction force horizontal

component error Ferr(n-1) at time t or a value of the floor reaction force correction amount determined on the basis of at least the value to an instantaneous value of a translational floor reaction force horizontal component produced on the first dynamic model at the time t by the motion after the n-th correction satisfies the permissible range at the time t,

the ZMP error change amount ΔZMPerr is composed of a time series, in the predetermined period, of either a difference between a value of the n-th ZMP error ZMPerr(n) at each time and a value of an (n-1)th ZMP error ZMPerr(n-1) at the time or a difference between a value of the n-th ZMP error ZMPerr(n) at each time and a value of the ZMP correction amount determined on the basis of at least a value of the (n-1)th ZMP error ZMPerr(n-1) at the time, and the translational floor reaction force horizontal component error change amount ΔFerr is composed of a time series, in the predetermined period, of either a difference between a value of the n-th translational floor reaction force horizontal component error Ferr(n) at each time and a value of an (n-1)th translational floor reaction force horizontal component error Ferr(n-1) at the time or a difference between a value of the n-th translational floor reaction force horizontal component error Ferr(n) at each time and a value of the floor reaction force correction amount determined on the basis of at least the value of the (n-1)th translational floor reaction force horizontal component error Ferr(n-1) at the time, and

the convergence discrimination processing of the desired

motion determining means is the processing for determining that the ZMP component error change amount ΔZMPerr has converged to zero when a predetermined third characteristic amount in a pattern of the time series constituting the ZMP error change amount ΔZMPerr has fallen within a predetermined permissible change amount range for the third characteristic amount and also for determining that the translational floor reaction force horizontal component error difference ΔFerr has converged to zero when a predetermined fourth characteristic amount in a pattern of the time series constituting the translational floor reaction force horizontal component error change amount ΔFerr has fallen within a predetermined permissible change amount range for the fourth characteristic amount.